SMART HEALTHCARE MONITORING SYSTEM

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ABSTRACT

Health monitoring systems are valuable because of the chance of ideal and proficient medical care administrations. These systems depend on cutting edge remote and wearable sensor innovations. The fast development in innovation has surprisingly upgraded the extent of far-off well-being checking frameworks. In this paper, a constant health observing system is created thinking about the expense, simplicity of utilization, precision, and information security. It provides constant remote bio-signals observing systems dependent on the Internet of Things (IoT) innovation. The system is conceptualized to give an interface between the specialist and the patients for two-way correspondence. The Number of individuals who require medical services increases day by day and the regular monitoring systems require patient's participation face to face inside medical clinics. This may create a wasteful circumstance to deal with the patients, particularly the individuals who have basic and unsteady ailments. Subsequently, web innovation alongside present-day electronic gadgets could offer promising arrangements in this field. In view of that, this venture uses a versatile application as an IoT stage to screen distantly the live ECG signal, heart rate and the body temperature of the patient. The signals are estimated and prepared by utilizing a microcontroller-based gadget (Arduino) and sent to the cloud using ESP8266 microcontroller and the location is monitored by the GPS module.

The principal reason for this study is to work with the far-off heart patients in getting the most recent medical care administrations which probably won't be conceivable in any case because of low specialist-to-patient proportion.

Keywords: IoT, ECG, Heart rate, Temperature, Arduino, ESP8266, GPS module

1. INTRODUCTION

Smart health monitoring system is an extension of the hospital medical system, which can remotely monitor the condition of the patient's body. Traditionally, the detection system is only used in hospitals, which are characterized by large and complex circuits and high-power consumption. The semiconductor technology industry has given birth to smaller, faster, lower-power, and affordable sensors and microcontrollers that have made progress in remotely monitoring the vital signs of patients, especially the elderly. The monitoring system can be used by the patients who are known to have a disease that regulates the instability of the organ system in the case when a new medicine is administered to the patient. Vital signs of the patient susceptible to or who has suffered from heart disease earlier can be monitored to predict and warn signs of physical condition. Patients whose body organs are in critical situations. This is also suitable for elderly people who may have health problems. These are all conditions that lead to the development of a life-threatening situation.

This project is important for several reasons, because in today's world, many people suffer every day for patients who are unable to perform operations correctly and on time. Sometimes it becomes difficult for hospitals and clinics to often take a look at a patient's condition. Also, non-stop tracking of Intensive Care Unit (ICU) and Critical Care Unit (CCU) patients could be very hard. To cope with those styles of situations, our device is beneficial. Our device is designed for use in hospitals and houses additionally for measuring

and tracking diverse parameters like temperature, ECG, heart rate and SpO2. Our system helps to grasp this situation. The result can be recorded with Arduino. Doctors can also view these results by using the web portal. Notifications are also generated and sent to the doctor, and our system can be used to monitor anyone's status by simply plugging in the device and recording. In this case, we can analyze the patient's condition based on the patient's previous data and send medical aid in case of emergency. Several systems have recently emerged to solve the problem of remote health monitoring. The system has a wireless sensor system that can wirelessly send sensor information to a remote server, and some even use a service model that requires payment. This is an obstacle in the country, because some people cannot use them due to cost issues. There also exists an Internet connection problem, that is, some systems require good Internet quality to make real-time remote connections. It is still a problem in developing countries. Many systems have been implemented in developed countries where the infrastructure is perfectly functioning. In most cases, these systems are suitable for developing countries. In order to alleviate some of these problems, remote sensing needs to be handled from a grassroots perspective to meet the basic minimum requirements currently prevailing in developing countries. You can refer to it by the number of recognized parameters.

2. LITERATURE REVIEW

In the past, the health of patients was monitored by holding hands and checking their pulse. With the passage of time and the introduction of health monitoring technology, the quality of health measurement and understanding has improved. This technology has developed so fast that a small device is now used to monitor patients.

Several projects are related to the development of wearable wristbands, while others are aimed at monitoring individual patients during daily activities at home or in the hospital. An electronic health system based on a radioactive and passive positioning wireless sensor network is proposed by Han and Yuo et al [1]. The author recommends using wireless sensor networks for continuous monitoring around the clock without interrupting the daily activities of the elderly and their caregivers. Use mobile body sensors. A hybrid location algorithm for elderly positioning is proposed. The purpose of this position is to help the system determine a person's activities and further determine the patient's health status Anlicker, JA Ward and others. Developed a portable medical warning and monitoring system for people at risk of heart and respiratory diseases [2]. The system combines multiple life parameter measurement, online analysis and emergency detection, activity analysis and cellular communication with the telemedicine center in a humble wristband device.

3. EXISTING SYSTEM

There are a few shortcomings found in the current system. The affected person is monitored in the ICU and the facts transferred to the PC are wired. Such structures come to be tough in which the gap among System and PC is extra. The structures are big in size. Regular tracking of affected people isn't always feasible as soon as he/she is discharged from hospitals. These structures cannot be used at a personal level. The different problem with those structures is that it isn't always able to transmit facts constantly, additionally a variety of barriers of various wi-fi technology used inside the structures.

4. PROPOSED IDEA

The main goal is to develop a patient health monitoring system with two-way communication, wherein patient's data is not only accessible through web portal but also sent to doctors via emergency notification alert so that doctors can send necessary advice to patients and their families about their current condition. They can also use Google Maps to track the location of patients at any time, so that immediate medical services can be provided to the patients without delay.

5. COMPONENTS

I. Arduino UNO

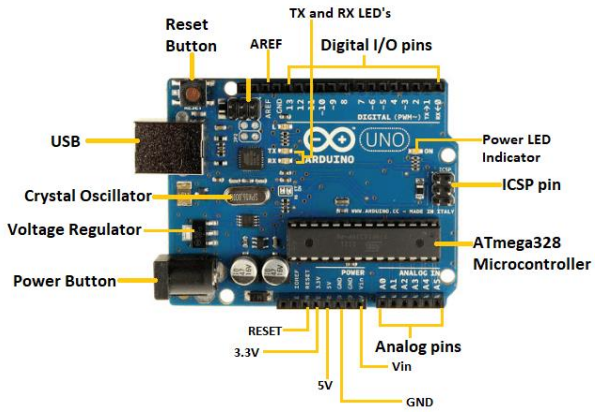

Fig.1 Arduino UNO Board

Arduino Uno is a microcontroller board which is based on the ATmega328 series of Controllers. It contains 14 digital input and output pins, six analog inputs for connecting with external components, and a 16MHz crystal oscillator. Uno additionally consists of a USB connection, a power button, an In-Circuit Serial Programming (ICSP) header, and a reset button. It requires a power supply of 3.3 V and 5 V.

II. ESP8266 Wi-Fi Module

Fig 2 ESP8266 Microcontroller

ESP8266 is a very easy-to-use and low-cost device that can provide an Internet connection for your project. The module can act as an access point (access point can be created) and site (can be connected to Wi-Fi), so you can easily retrieve and upload data. To the Internet, this makes the Internet of Things as simple as possible.

III. AD8232 ECG Sensor

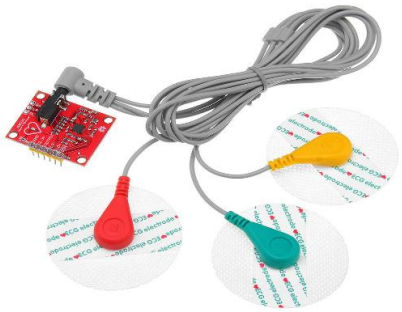

Fig 3 ECG Sensor

The AD8232 single-line heart rate monitor is an economical board for measuring the electrical activity of the heart. It is an integrated signal conditioning device suitable for ECG and other biopotential measurement applications. It is designed to extract, amplify and filter small biological potentials.

IV. GPS Module

GPS stands for Global Positioning System that uses signals from satellites in space and ground stations on the earth for positioning location on the earth. The NEO6M GPS receiver module uses USART communication to communicate with a microcontroller or PC. The latitude, longitude, altitude, UTC time and other information received from the satellite are used as NMEA strings.

V. LM35 Temperature Sensor

This fully simulated temperature sensor can perform accurate temperature measurement in humid environments. LM35 is a precision integrated circuit temperature sensor whose output voltage is linearly proportional to the temperature in degrees Celsius.

VI. Heart Rate Sensor

The heart rate sensor provides a simple method to study the function of the heart. It can be measured based on the principle of the psychophysiological signal used as a stimulus for the virtual reality system: the amount of blood in the finger changes over time.

6. METHODOLOGY

We have used 3 sensors for patient monitoring: first is a temperature sensor, the second one is a heart rate sensor, and the third is ECG sensor. This project is quite useful because doctors can monitor the patient's health parameters by simply visiting a website. Now, doctors or relatives can monitor or track the health of patients by simply logging in to the web portal with a unique API key. Proper internet connection is required to process and upload the data to the database and send it to the cloud. ESP8266 Wi-Fi module is connected to Arduino UNO. The Arduino UNO board reads input from all the sensors simultaneously. It sends this data to the cloud by sending this data to a specific URL/IP address. Then repeat the action of sending data to the IP after a certain period of time.

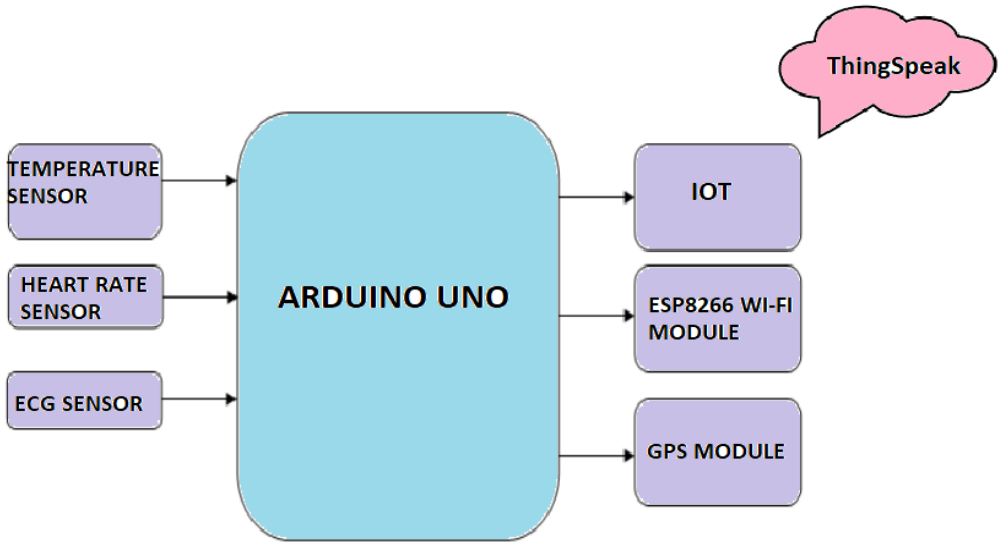

Fig 4 Block Diagram of the System

7. CONCLUSION

This article details the health tracking applications developed over the recent decades that have had a positive impact on today's technology. Through the overview of these researches, we understand the mindset of innovators who use conventional sensors (such as room temperature sensor, Arduino as a microcontroller board, local server or cloud) to develop these systems. After extensive research, we found the Amazon Web Services (AWS) to be the ideal Cloud for this type of application to maintain data security as an easy-to-use method. Other clouds can also be used to send details and observe regularly. If we can also focus on these tracking systems for specific diseases or age groups, we can use and preliminary human data accordingly, which can help patients or individuals use machine learning technology to predict their physical condition as each person has different temperature ranges, different blood pressures, and different details.

8. FUTURE SCOPE

1. Additional wi-fi module is connected to Arduino UNO. It would be better if it is in-built to reduce complexity.
3. Blood Pressure and Glucose level sensors can be added to make this system more efficient for use in ICU.
4. As of now only one patient's vitals can be monitored at a time, it can be made to work for several patients to reduce cost.

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